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A survey of research and development studies currently needed in early childhood education stresses child development and its relation to instruction. Topics which have been discussed are perception, oral language, concept formation, learning set, motivation, and the psychology of learning. Universities and public school systems working together in longitudinal research studies of teacher-pupil interaction, curriculum effectiveness, and instructional methods will provide information to be built into educational action programs. Since children develop both through maturation and interaction with environmental stimulation, specific instruction for cognitive, language, and perceptual development is presently being given in compensatory preschool programs. Followup-study results from these programs, as well as from research projects, should be used to revise and improve future instructional schemes. A review of the literature of curriculum development for kindergarten children and a bibliography of early childhood studies are provided. (MS)

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Promising Directions for Research and Development in Early Childhood Education[1]

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During the past decade early childhood education has been given an unprecedented degree of emphasis on the American scene. Part of the reason for this--and a large part--lies in the growing concern over the relatively poor academic prospects of the children of low socioeconomic status families. What these children share, together with some from families of better means, is a serious disadvantage when it comes to coping with the demands of elementary school programs. Such a disadvantage usually results in what has been termed "cumulative failure" or "progressive academic retardation," as these children move up through the grades.

In response to this problem various kinds of efforts have been mounted both within, and parallel to, regular school programs (e.g., 4, 44). Among these are "Operation Headstart" and other longer pre-kindergarten programs which attempt to provide "compensatory" instruction to make up for what is judged to be inadequate preparation for schooling in earlier home experience.

But there is also a more far-reaching development that contributes to the rise of interest in early childhood education. In what represents a significant departure from the thinking that prevailed for most of the first half of this century, it is now coming to be more and more widely accepted that early cognitive and language development require, together with physical and personal social development, particular kinds of environmental stimulation, including adult intervention. So it is that where, formerly, middleclass parents who could afford it sent their children to nursery schools largely for group experience and the development of social skills, while the children of working mothers were minded in day-care centers, today the education of three- and four-year-olds, both rich and poor, is beginning to take on a different tone. Specific instruction for cognitive, language and perceptual development is being added. Even though there is a degree of irony in the fact that the expensive Montessori schools in the United States are offering middleclass children a program that had its origins in turn-of-the-century Rome as a compensatory program for children of crowded slum homes, these schools and many other programs for pre-kindergarten children are part of what may already be a well-established trend towards public nursery school education.

But, while a good case can be made for the educational value of nursery schools, it would be difficult to justify the expense of providing universal public nursery education within the context of our present school structure. Most middleclass children do quite well without it, and so far, unfortunately, we do not know that present compensatory programs are producing the results that are desired. Nevertheless, it is important that we maintain the larger perspective of early childhood education generally. To deal with the educationally disadvantaged as a special group is to be very short-sighted and to invite many dangers and restrictions. Indeed, if we cannot turn the many resources that are currently being made available for working with disadvantaged children into knowledge that will increase our understanding of educational services and their relationships to the development of children generally, we shall be left holding the pumpkin, as Bud Spodek has suggested (74), when the present fad passes away, taking with it much financial support.

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The situation that we face as professional educators is this: we feel we must do something to help educationally disadvantaged children, yet we simply do not possess sufficient understanding of the relationship between instruction (or any kind of outside stimulation) and the cognitive and language development of children to feel any assurance that what we are doing is best. It is not only not clear to us why certain students fail in our school programs and what we should be doing about this failure; we do not really understand why other students succeed. We need to know much more than we do about the conditions of success (62) --both those which are within the control of the schools, and those which are influenced mostly in other parts of society, especially the home. Under the pressure of urgency, government appropriations, and foundation grants, various kinds of "compensatory" programs have been produced, but even the most carefully planned of these represent only good guesses and partially tested hypotheses as to what problems are involved and what real solutions might be.

To be more specific, questions such as the following have not really been raised adequately, much less answered--except by implication--in present preschool programs: How much of what can be done in school-type settings might be accomplished by altering existing kindergarten and primary programs? Are existing school programs, and the goals inherent in them, what we really want all (or any) children to "succeed" in? (Have we, almost without recognizing what it is that we are doing, shifted from an earlier interest in tailoring instructional programs to children to a latter-day interest in fitting children--especially the "disadvantaged"--to the needs of the schools?) For fostering optimum desired development of children from three to five years old, would even five full days of instruction per week away from home be sufficient, or are interventions that extend into homes and other aspects of the environment essential? How much of what can be done in school-type settings might be accomplished by altering existing kindergarten and primary programs, rather than by adding preschool units? Are there "critical periods" for certain dimensions of children's development beyond which required training becomes very difficult, if not impossible to provide? (e.g., 9, 15). Or, are minimal time periods required for certain dimensions of development, regardless of the type or intensity of instruction provided? What are the most fruitful ways of assessing or diagnosing the progress of individual development? Are we employing, or have we, indeed, even invented or discovered the most fruitful procedures for helping make operational individual capacities for growth and development?

These are representative, only, of many questions which need to be posed properly. While we cannot hold up programs of action until answers are found, it is part of the major thesis of this paper that we can and must at least: (1) draw more heavily upon certain available sources of insight than we have, and (2) mount the carefully designed, longitudinal type of research that is necessary to provide needed knowledge about early child development and its relation of instruction so that it is built into our action programs. The remainder of this paper will be devoted to calling attention to three promising sources of leads for development, research, and professional training, and to suggesting a strategy for approaching the monumental task of following these leads into the reconstruction of early childhood education (and, hopefully, much of the education that follows). First, however, a word or two about the stance that should be taken by educational researchers and others involved in the development and evaluation of educational programs. What we seek is a clearer understanding of the various dimensions of effective instruction; that is, the kinds of procedures, materials and settings, which can be deliberately planned and provided by adults (and children), that have the highest "payoff" in the realization of the human potential of many different kinds of growing children. Some of the elements we seek may have yet to be invented, but most have probably

been practiced by gifted teachers for many, many years (e.g.6, 59). (We make a serious mistake when we convey the impression to teachers--as we often do--that many of the things we may want them to do in the name of improved instruction are something brand new, things that have never been done before.) The problem is that we do not have enough of it collected, organized and described in ways that permit us both to reproduce more of it more consistently, and to create it where it does not yet exist. What we need are behavioral science ways of describing what many have known intuitively for years, together with operational statements of aims that we have been labeling with slogans for many decades. What the behavioral science of education should develop is the theoretical power and procedural skills to produce such descriptions and such operational definitions.

If what we seek, then, are productive patterns of instruction wherever they may be found, there are three emerging trends which should be of great help in the search. Two of these trends can be traced back at least as far as the educational writings of John Dewey. In fact, one way to approach them is to say that we now seem to have within our reach the insights and tools for putting into operation the kind of programs for children that he was quite foresightedly looking for many decades ago (although most of us may never really have understood what that was). That is, perhaps more than ever before, we are in a position to turn slogans such as "meet the child where he is," and "help children build knowledge on the basis of experience" into more extensive and consistent operational form. The three emerging trends that should contribute heavily to our understanding of human development and how instruction can be fruitfully related to it are: (1) recent research on many dimensions of child development, (2) study of the scholarly disciplines as sources of insight into children's knowing and learning, and (3) recent developments in research on instruction, or teaching--that which should be the educational researcher's main focus of attention. It is the main thesis of this paper that these three strands, if spun together properly, could produce the theoretical and research framework for a new era in early childhood education--and for educational generally.

The reader is invited to participate in the search for the components of this framework, especially through following up the bibliographical leads provided here and through critical response to the ideas presented.

Guides from Child Development Research

This is not the place to attempt a thorough summary of even recent developments in this area; what follows is only intended to call to mind selected strands of research and theory dealing with various dimensions of human development that are representative of what might fruitfully be tapped to nourish the rethinking of early childhood education. Before proceeding further, however, an assumption underlying this paper, and this section in particular, should be made clear: early stimulation is as important to intellectual development as it is to physical-motor and emotional-social development; indeed, it seems clear that all dimensions of human being have a very strong intellectual or cognitive component. In a book that may well turn out to be recognized as one of the major landmarks in this break with the assumptions about early child development that prevailed during the first half of this century, J. McVicker Hunt (43) has pulled together evidence to show that, although heredity exerts a strong influence, the functional realization of each individual's intellectual capacities (and thus to an extent all capacities) is very much dependent upon the quantity and quality of the ways in which he operates upon his experience. The course of intellectual growth is not fixed, but can be opened up or restricted, depending upon the kinds of experience--including

instruction as to what to do with that experience--that each child has. Moreover, Hunt shows evidence for what many nursery school teachers must have known for a long time, that motivation for inquiry and learning is not explained adequately by the postulation of tensions and drives needing reduction, but that tendencies toward outreach and exploration seem to be inherent in the human organism, and operate unless blocked.

The major work upon which Hunt has drawn, of course, is that of Jean Piaget and his associates. It is this work of several decades standing which can serve as a developmental foundation upon which to build a framework in which to interrelate the work of many others, some of which will be identified shortly. Briefly, the Piaget approach has resulted in the construction of an image of cognitive development as taking place along a continuum of distinctive, yet overlapping and interdependent stages. Each stage finds the child employing certain predominant and qualitatively different ways of operating upon the data of his world in order to render it comprehensible. And the quality of learning and development at each stage is basic to the quality of development that will follow. While maturation is essential to the movement, for example, from preoperational to concrete operations thinking, so are particular kinds of encounters: both the confrontation with certain kinds of data (e.g., objects to see and manipulate, spoken language to hear, events to witness) and instruction in ways of processing that data (e.g., models to imitate, evaluative feedback, social interaction, and direct teaching).

The growing child's grasp of the world is continuously developing. It is important to understand that young children cannot know the world in the ways in which adults, or even older children do (2, 3); yet it seems necessary also to understand that children can comprehend more than we have usually given them credit for in the past (81). In the work of Piaget (29) and others, this developing understanding of the world consists of the construction of cognitive structures in which information is processed and given meaning. These schemata (29,64), or structures (19,20), or subsumer networks (10) are not present at birth, but must be developed both through maturation and through the stimulation of continuous interactions of each individual with his environment.

To find out the optimum "hows," "whens," and "wheres," for providing this required stimulation and nourishing the interaction, is a major problem of the early childhood educator. How to provide needed instruction is not obvious in the results of child development research. Instructional translations must be made, and there are two main sources of help in making the translations in addition to those just covered. The first is in other branches of psychological research, which will be identified as:

(1) perception, including auditory, visual, and tactile discrimination skills (24,44,50). Even though cognition strongly influences perception as children grow older (72), adequate development of discrimination skills are, in young children, basic to the development of cognitive structures, since they involve the input of the data to be processed.

(2) oral language, including both vocabulary (e.g., 47, 77, 79), in particular verbs, prepositions and other words signifying relationships, and syntax, in which statements relating concepts are framed for communication (e.g., 18, 21) and which, as "inner speech," may be the major medium for the mediation of thought (e.g., 13, 55, 80). There are strong indications that the quality of early oral language experience is influential to the quality of later thought. What implications grasp of syntax holds for instructional programs is not yet entirely clear,

except that the "correctness" of pronounciation or grammar per se does not seem to be the key (e.g., 38).

(3) concept formation and the repertoire of concepts that are signified by the words of one's vocabulary (e.g., 16, 60), and individual styles for classifying or categorizing data (e.g., 48, 71). As a result probably of both genetic makeup and environmental influences, children show differences in the ways in which they process information. Some of these may be more or less continual "cognitive style" differences; others may represent gaps or lacks in development to date; in either case, specific adjustments in the type of instruction offered may be indicated.

(4) learning set, and other aspects of "learning how to learn" (e.g., 52, 70) The approaches to inquiry or problem solving that one makes seem to be influenced by the extent to which similar problems have been faced in the past.

(5) In addition, just as cognitive development is basic to other dimensions of development, so is it in turn influenced by affective, or motivational, factors. These include the individual's self-concept, his attitudes towards himself as a learner and towards school or other educational settings (e.g., 8), the influence of his peers (e.g., 83) and the attitudes of his teachers towards him (e.g., 22). Home environment variables have also been shown to be related to variations in intellectual functioning (e.g., 42, 58, 84).

(6) Finally, the many decades of work in the psychology of learning must be included. Even though it may be said that learning does not explain development, insights into various aspects of human learning can contribute much to early childhood education, when viewed, together with the other dimensions identified above, within the perspective of a larger framework of child development. Representative of this, is the work on reinforcement theory and the whole associationist approach to learning research. These psychologists have contributed much directly to our understanding of how particular kinds of learning take place, learning which presumably contributes to the building of schemata. There has also been a movement among the associationists beyond the simple stimulus-response paradigm to models that involve mediational processes and hierarchies of association chains (e.g.,45). Some have also helped to illuminate the role of language representation, or "mental mnemonics," through work on serial and paired-associate learning tasks (e.g., 67). Taken together with other schools of learning, such research has and can contribute much to our overall understanding of children's development and its relationship to instruction. Let's not neglect either the work of people such as Anna Freud, Bruno Bettelheim, Erick Erickson, and others, which should be included in our framework, but into which it is beyond the scope of this paper to go.

An obvious implication of the preceding for work in early childhood education is that we should cease (where we still carry it on) seeking one-dimensional answers: a theory of learning, single IQ and "readiness" scores, the one good method of teaching. Instead, our study of children, our planning of instructional programs, our evaluation efforts should all be multi-dimensional in scope. And our focus should be on the maximum realization of individual potential at each stage of development--not on producing "readiness" for the next stage, a focus which too often leads us to neglect essential characteristics of the current stage.

As a way of tying the threads of this section together, three aids to synthesis can be suggested. The first is contained in an article by Martin Whiteman (82) in which he interrelates the concepts of factor from psychometrics, learning set from

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learning theory, and operation from Piaget's work around two characteristics of mental functioning: inter-situational consistency and hierarchical organization of levels, and then proceeds to draw implications of such interrelationships for the conceptualization, design and evaluation of instructional procedures. The second is an "open systems" conception of the human organism-personality engaged in dynamic development by Lawrence K. Frank (31). Frank suggests that the various dimensions (physical and mental) of the growing child be viewed as in dynamic configuration ("whole child") which cannot finally be fractionated without losing or destroying understanding of the basic processes involved, and offers the "open system" as the unifying model. He also calls for the building of a scientific discipline of human development going beyond the specific quantified findings of the physical sciences, where the concern is with "mechanisms" and "factors" and inter-correlations among specific variables, to a multi-dimensional approach to the intact living, growing, and aging organism-personality.

The third aid provides a bridge to the consideration of the disciplines in the next section. It is a basic philosophical-epistemological assumption about man, namely that he is most characteristically a user of symbols (e.g., 53). The key to man's humanity is seen by some as lying in his ability to employ representative symbols to produce whatever meanings there are in living and to communicate these meanings to his fellow man. Symbol manipulation ability is, however, at the same time (1) a source of strength and meaning, inventiveness and creativity, and the ever-increasing realization of human potential; and (2) a source of weakness and confusion, of regression and stereotyped behavior, and of severe restrictions on the realization of human potential. There is no guarantee that children will grow up able to employ symbols in ways which permit maximum self-realization and most effective functioning in the 20th century world. Careful guidance in the fruitful ways of human knowing is essential.

Guides from Man's Organized Ways of Knowing

The patterns of meaning that are human knowledge share in common the characteristics of order, logical form, and communicability; at the same time various areas of knowledge different from each other in the particular kind of order they seek, in the logical form that is appropriate and in the mode of effective communication. Most human ways of knowing have been elaborated over the years by communities of scholars that bear the labels of the major disciplines or fields of scholarship. The members of these communities are related to each other by common agreements on the scope and rules of inquiry and through the use of certain key concepts and groupings of concepts that are the chief ways of giving form to the knowledge they seek.

Just as it has been commonly assumed that early cognitive development takes place best if left alone, so it has been (and still is) assumed that disciplined knowledge is only for adults. Jerome Bruner (20), along with others, has suggested that this latter assumption is wrong; that is, that as long as it is presented in forms which are appropriate to children's stage of development, children can understand much that is valid to the various disciplines (20)--and a good deal more than we have usually given them credit for being able to grasp (66,81). What we need to determine more clearly for early childhood education are aspects of all the various ways of knowing which correspond to the "enactive" or sensorimotor, "iconic" or concrete operations, and "symbolic" or formal operations stages of cognitive development. What we have apparently failed to notice in our concern for not pushing "too much too soon" in the cognitive domain, is that the very children in whom we delight because they are creative and open and aware of the world around them are probably that way because

they have begun to erect a cognitive structure, or ways of discipling their thinking, if you will, which make their awareness and openness and creativity possible.

Assuming the need for discipline and structuring of some kind, the problem is to find ways of helping individuals build the cognitive structures that permit maximum development of meaning and individuality, together with maximum ability to share and participate with other human beings in the process--that is, as they grow older, to be increasingly able to share in man's best worked out ways of knowing. Humans depend upon cultural involvement with other human beings for their very humanness, yet such involvement can be stifling and deadening. This presents a problem, but the solution to the problem does not seem to lie in a laissez-faire, undisciplined approach which can be just as stifling and deadening, especially since some kind of order is essential. The kind of order is at the heart of the problem. As human knowledge grows, as the diversity of cultural patterns to which children are exposed increases, the more crucial becomes the need for guidance in ways of extracting meaningful and consistent patterns out of all they experience. Since we find we cannot hand children knowledge as we understand it as adults merely by programming it under the guidance of one school of learning or another, we must seek ways of helping them to build it up gradually--and to continue the building for the rest of their lives.

It has been suggested by a number of different people (27,63,68) in recent years that the scholarly disciplines be viewed by educators not only as sources of what is "known," that is, content or subject-matter to teach, but also as sources of ways of "coming to know," that is, of what to look for--in building "subsumers" or cognitive structures through which to understand the world. The assumption made is that the scholarly disciplines are, or could be, the clearest sources of the "how" to know as well as the "what." In the key concepts, in the rules of inquiry and proof, in the unique approach of each discipline and in the characteristic kinds of phenomena upon which its scholars focus their attention, it is proposed, are important sources of understanding the ways in which children do, or could be helped to weave the data of experience in the here and now into the concepts and thence into the ever-growing fabric of schemata that permit them to transcend moment and locale on their way to the broad understandings of which the adult is capable. Modes of inquiry cannot of course be separated from the content they produce, but by emphasizing the ways of knowing schools may be able to clarify their roles in relation to providing instruction, at the same time releasing themselves from the burden of the "coverage" of particular knowledge, or subject-matter, thus permitting them to equip their students to keep up with a world of rapid change and development. Instead of having curriculum guides full of outlines of particulars in the form of information or main ideas or key generalizations, we could concentrate on equipping teachers and students for dealing meaningfully with many different sets of particulars. Early childhood educators have long had a strong interest in promoting "socialization" and social skills; the disciplines could be a source of "cognitive socialization," as well as a source of enrichment for the development of social skills and self-knowledge.

Examples of early childhood educational approaches employing the combination of insights from child development research and studies of the disciplines are rather scarce at this point, especially for use with preschool children, but there are several elementary school projects which are taking strong steps in this direction. These will be overviewed below, and references provided as leads for further exploration on the part of the reader, since space does not permit full treatment of these projects in this paper.

The Science Curriculum Improvement Study (49,78) came into being at the Berkeley campus of the University of California as a result of dissatisfaction felt by Robert Karplus with the extent to which elementary school science programs were failing to produce "scientific literacy" in students (49). What has resulted is a program, now commencing in first grade, which is designed to lead children into the exploration and conceptualization of the physical world in ways that deliberately parallel Piaget's stages of cognitive development. Children are first asked to describe objects in the world around them employing physical properties such as color, shape, size and texture as bases for classifying, sorting, seriating, and comparing. This work helps form the basis for work in later grades which deals with variation and measurement, interactions of objects in systems and subsystems, relativity, and so on, up the ladder to consideration of more commonly known physical and life science topics. The first grade, and preliminary kindergarten units have ingredients that seem adaptable for use with younger children--especially since there is a striking resemblance between these and both a "Piaget-derived" preschool program which Celia Stendler has worked out in Champaign-Urbana (75) and the older Montessori method. In economics, Lawrence Senesh (69) has developed the "Our Working World" series for the primary grades. This series introduces children to basic economic concepts such as family, food, clothing, shelter, producer, consumer, tools, and division of labor as guides for selecting out of the data of the world around them those judged particularly useful for later building the patterns of relationships which represent economic understandings. The appropriateness of this sort of approach for kindergarten children was explored systematically by Helen Robison (66) and later incorporated in a compensatory program in New York City (65). The Robison study focused on the concepts of economic interdependence, scarcity, and production and drew data from the supermarket and children's own families. Robert Arnold has developed a "discovery" (i.e., inductive) approach to the teaching of geography (both physical and cultural) and history (5). In a sequence that could very well be coordinated with the S.C.I.S. work on material objects, children are guided first in the description of characteristics of the physical environment that are combined in the concepts of bedrock, climate and topography. They then are led to understand how there variables interact in consistent fashion to produce the world's geographic regions. Descriptions of such characteristics as the properties of bedrock, soil and flora seem quite appropriate for even nursery school age children. These can be followed in the primary grades by measurement operations involving such concepts as annual rainfall and length of growing season and in the middle grades by the prediction of topography and foilage, given bedrock and climate information. Finally, children are able to assess the potential of a region for man's living, thus laying the groundwork for cultural geography and history. Bernard Spodek has dealt with similar geographic and historical concepts with kindergartners (66,73)in a project that emphasized the use of timelines and mapping in dealing with experiences in the here and now, so as to permit children later to reach out meaningfully to events and areas more remote in time and space.

Other projects could be mentioned. These would include the published kindergarten materials of the Greater Cleveland Mathematics Program (37), and others which stress the concepts of set and number. There is also the work on children's acquisition of syntax (e.g., 17, 76) which has already increased our understanding of children's oral mastery of their native language, and has many promising implications for the design of instructional programs to aid that mastery process. In fact, recent contributions of the discipline of linguistics to many aspects of language teaching, is one of the best examples of the sort of help studies of the disciplines can yield for educators. In this case, the major emphasis has been upon illuminating how it is that people of different ages learn language--both

their own and ones from other cultures--so that light can be shed on the most effective ways of organizing instruction. The combination of linguistic principles and operant learning principles have for example, been combined rather promisingly in the "audio-lingual method" of second language teaching.

There is also a class of what might be called "pre-disciplinary" instructional programs which draw upon the work of developmental psychology, disciplines such as linguistics and learning psychology, but which have no clear identification with any of the other knowledge disciplines. Thes: include the preschool compensatory programs of Deutsch (44), Klaus and Gray (51), Stendler (75), Bereiter (12), and the Montessori schools which, although developed some years earlier, several writers (e.g., 34, 43a) have suggested carry into practical pedagogy that which seems implied by the Piaget research.

All of this is, of course, only a beginning. Much development, and careful longitudinal research, is still ahead of us, both in the areas covering the aspects of man's being mentioned above and in other important areas that have yet to be explored from the point of view suggested here. These include personality, especially self-knowledge (46, 63,), interpersonal relationships, moral and aesthetic values, art, music, literature, and religion.

Vital to the needed research, as well as to the on-going evaluation of instructional programs, is the development of new means of assessing various dimensions of children's development which go beyond the achievement and aptitude tests commonly employed in school systems. One research project that might help lead to fresh assessment approaches is now in progress, under the direction of Millie Almy. This study seeks to find the extent to which differences in second grade logical thinking (Piaget categories) of children now in kindergarten result from exposure to instruction in "new" curricula in science (A.A.A.S. and S.C.I.S.), mathematics (G.C.M.P.), and economics (Senesh), and/or more standard curricula in the same subject areas. Pre-testing involved Piaget conservation and class-inclusion problems. At the beginning of second grade, more extensive interviews involving similar tasks which are designed to take into account analyses of the cognitive skills that should be fostered by the "new" programs, will be carried out. This research should throw light on the question as to whether specific training can influence development from the preoperational to the concrete operations stage either within or across individual knowledge areas.

Guides from Research on Instruction or Teaching

Teaching, or instruction, is a dimension of our work as educators which is at the same time the most central and yet perhaps the least well understood. It is the purpose of this section to help open up an examination of this problem, particularly as it relates to early childhood education.

First of all, it seems to make a distinction between the two terms which are commonly taken to be synonyms. Teaching, let us say, is what we do when we "give lessons" (39) that are pre-planned, and usually rather formally structured. Lessons can be given by teachers directly to groups in classrooms, or over television, or through teaching machines, or in tutoring sessions. Most teaching of children takes place in schools. Instruction, on the other hand, can be taken to be a supra-ordinate class inclusive of teaching, but extending beyond it in both time and space dimensions. Instruction includes what John Herbert has identified as giving

lessons (here called teaching)*, serving as a model, creating an environment, self-teaching, and others (39, Chap. 2)

What these two concepts have in common is that they both refer to a relationship between a child (or children) and other people in the environment--most typically parents and teachers. This relationship that serves to stimulate, nourish, and regulate the course of learning and development. Other aspects of the environment can be seen as instructive too, aspects such as the mass media and the design of objects or materials and indoor and outdoor settings. But to say that instructive influences are available, is not necessarily to say that they are adequate, or even desirable in quantity or quality. That is, the kind of instruction available may neither be appropriately focused, properly timed, nor sustained long enough to meet certain kinds of developmental needs, especially those which call for guidance in actively operating on one's environment. When it comes to preschool children in poor families, it is mainly this last set of possibilities which are thought by many to be at the root of "educational disadvantage" (e.g., 25, 43a). There is evidence, moreover, that the nature of instructional influences in the home may be crucial even after children are in school. Richard Wolf, for instance, found that he could account for about three-quarters of the variance in the school achievement of Chicago fifth graders on the basis of a measure of selected characteristics of their homes (84). To do this Wolf designed a family interview instrument with which to assess home environments for the degree to which they provided nurturance for intellectual development generally, and for school achievement in particular. We need to know a great deal more than we do about the really functional educational forces in our communities.

This is not to say that we should abandon schools for a while either to see what happens without them, as Margaret Mead has suggested (57), or to concentrate on providing instruction through other institutions. We educators should, however, be much more aware of the wider setting in which we work. We should be trying to identify the nature of instruction, wherever it takes place, the relationship it has to development and learning, and how it might best be provided, for (and by) whom, and when--not confining ourselves to strictly school-type settings.

Of course, the easiest place to study teaching and other dimensions of instruction is in classrooms, if for no other reason than that we have easiest access to, and control over it there. The fact is that, despite many studies of classroom teaching over the past decades, the "science of instruction" is still in a very primitive state. The major studies of teaching have either tried to correlate different "methods" of teaching with various student outcomes and/or teacher characteristics, or they have tried to determine what kind of classroom "climate" is most closely related to certain other considerations (e.g., 33). Results from both kinds of studies have so far proved inconclusive. In the case of the "methods" studies, what actually took place in the classroom was seldom systematically followed up and described, so there may simply not have been any real (i.e., operative) differences among the treatments. "Climate" studies have included elaborate descriptions of classroom events but, with the possible exception of recent Interaction Analysis studies (e.g., 28), the patterns of teacher-pupil interactions and other interpersonal relationships identified may not be the ones that distinquish effective teaching situations from other kinds of good human relations situations. Aspects

* Herbert describes these as dimensions of teaching, for which the term "instruction" has here been substituted.

of "climate" may turn out to be necessary, but not sufficient conditions for instruction to take place. There is also evidence that even certain kinds of stressful situations may have a positive effect on learning and development (e.g., 23). In addition, we have up to now been preoccupied with a search for the good teacher, the right method, and/or the perfect climate for whatever it is that our instructional goals are. This is probably a fruitless search, because it seems to becoming increasingly apparent that the kinds of instruction (including the kinds of instructor) that are most effective vary markedly with different kinds of children, as well as with various dimensions and stages of development and learning. Several years ago Miriam Goldberg called for research to determine what kinds of teachers may be most appropriate for disadvantaged children (36), so that we could then proceed to see which qualities might be trained in pre-service and in-service programs, and which might have to be sought in the recruiting process.

It is extremely important that we set about systematically describing precisely what it is that takes place between teachers and students in different types of early childhood programs--especially those activities that deal with the cognitive domain, which is so central to working with all the others. We need to know the ways in which teachers structure classroom experiences and especially the kinds of responses that they solicit from students, to use Arno Bellack's terminology (11), or what operations students are asked to perform on the data of their world. Then as discrete activities are identified, we must look for patterns and sequences, for order and duration, both generally and in response to various kinds of children and different dimensions of learning and development. Finally we need to continue to try to build these descriptive patterns into hypothetical and theoretical formulations within which they may be connected in if-then relationships with changes in students. Even though a goodly proportion of teaching may turn out to be within the realm of art rather than science, theoretical frameworks, or metaphorical models are vital to our understanding of instruction (30) and to the fruitfulness of educational research.

Descriptive research of the sort indicated above has already been mounted by a number of investigators (e.g., 11, 28, 39), although most of it does not deal with early childhood classrooms. The author is just in the process of examining some of the classrooms in which the students in Millie Almy's study (1) are located to see what kind of differences there may be in the teaching patterns employed. Related to this, preliminary work is already underway for a comparative study of four different kinds of preschool compensatory programs which will be carried on this summer with a Project Headstart population in Berkeley. Both studies involve the use of wireless microphones to sample what teachers (and many students) say, together with observer narration of relevant non-audible teacher behavior--including materials used (40). Both channels will be recorded simultaneously on two tracks of a tape recorder and then transcribed to permit careful analysis of patterns of instruction. Of particular interest to the investigator are the kinds of cognitive operations which teachers demonstrate, solicit, or otherwise present to students. Patterns of teacher reinforcement of student behavior will also be examined. Theoretical grounding for these two studies is being synthesized from the work of Piaget, content analyses of curriculum outlines, and a number of studies of language learning and behavior in young children. The summer study is also tied to a larger one which will seek to determine the extent to which selected kinds of cognitive and affective changes take place in the children involved. It is possible that preliminary insights into the connections among certain types of instruction and student outcomes can be achieved.

A Suggested Research and Development Strategy

While all this needed research and development is carried out, school must keep. School systems simply cannot stop like factories to retool; children must be served continually, and the pressure is on from the wealth of available funds for work with disadvantaged children and preschool children in particular. The metaphor which one is tempted to use at this point is one of a school bus which has to keep shuttling children back and forth from school, despite the fact that it is getting old and worn. There is no time to take it out of service, so it must be rebuilt while it is in operation. Reconstructing school programs while keeping them in motion is very difficult, especially in a field as strongly influenced by tradition and "cultural habit" as is education. Other alternatives, such as separate experimental schools, have not proved to be an adequate solution to this problem so far. We are faced with the task of developing strategies for bringing about educational reform of a kind that has yet to be fully developed and understood.

One approach to this that seems promising is for university departments and public school systems to engage cooperatively in long-term programs of research and development. Neither university nor school system can do the required work alone, but properly developed, the combination has much potential. The reasoning here goes something like this. A school system's function is to provide on-going programs of educational services to children and their parents. Such programs not only serve a population, but can provide laboratory settings for developing and evaluating different kinds of services and for the training of professional workers. However, largely because of the nature of its political and economic relationship to a local community, it is difficult for a school system itself to carry on rigorous evaluation of its programs, even when it possesses the necessary personnel and funds. Programs initiated in a school district are almost invariably "doomed to success." It is also difficult for a school system to rethink and program elements (as along the lines indicated by studies of the disciplines and child development) since its personnel are deeply involved in maintaining what exists in operation. This makes schools very dependent upon "packaged" programs from publishers, curriculum projects, and other outside sources (e.g., "Operation Headstart").

A university, on the other hand, may contain a number of departments with both competence and interest in development and research activities relevant to early childhood education. (These might include education, psychology, architecture and design, and sociology.) Such departments can, and do contribute to the enrichment of educational services offered by a school district, both directly and through the training of professional workers. Such departments are also in a position to do the type of short-term and longitudinal research which is needed not only for evaluation of particular programs in individual school systems, but which could add to our basic knowledge about early childhood education generally. What is often lacking are populations of children (and teachers) outside of laboratory settings with which to carry on this research, so that the findings might eventually be more widely applicable.

Continuing cooperative arrangements between universities, either directly or through supplementary educational centers and regional R & D centers, and groups of school systems could mean programmatic research and development over at least a decade's time which might permit fulfilling the conditions of sound experimental research while continually providing students with educationally defensible experiences. Above all, working through an agency which can study the whole community rather than confine attention to the schools, may enable us to explore variables and relationships which have heretofore not been considered together within the framework of an interest in early childhood education.

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